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# On *Scaphidium grande*-complex (Coleoptera, Staphylinidae, Scaphidiinae)

Liang Tang†, Li-Zhen Li‡

*Department of Biology, Shanghai Normal University, 100 Guilin Road, 1st Educational Building 323 Room, Shanghai, 200234 P. R. China*

† *urn:lsid:zoobank.org:author:F45FE527-E59A-4702-A87E-B45BC33ED4C7*
‡ *urn:lsid:zoobank.org:author:BBACC7AE-9B70-4536-ABBE-54183D2ABD45*

Corresponding author: *Liang Tang* (monkey_zzz1980@163.com)

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## Abstract

The *Scaphidium grande*-complex is defined and six new species of the complex are described: *S. longum* **sp. n.** from Hainan Province, *S. spinatum* **sp. n.**, from Anhui Province, *S. laxum* **sp. n.** and *S. inflexitibiale* **sp. n.** from Yunnan Province, *S. reni* **sp. n.**, from Guizhou Province, and *S. liui* **sp. n.**, from Xizang Autonomous Region. Their diagnostic characters are illustrated and a key to *Scaphidium grande*-complex is provided.

## Keywords

Coleoptera, Staphylinidae, *Scaphidium grande*-complex, new species

## Introduction

*Scaphidium grande* Gestro, 1880 is a common species widely distributed in south Asia. It can be easily distinguished from the thus far known congeners by its large body size, the strongly convex pronotum, and the black body with reddish fascia on mesofemora and metafemora. None of the previously described species was considered as closely related to *S. grande*.

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Recently, we have examined many specimens of *Scaphidium* collected in China and, surprisingly, found six new species closely related to *S. grande*. Thus, *Scaphidium grande* forms with its allies, a monophyletic complex that is defined by the following characters: body large, length: 5.9–9.5 mm; body color: black, sometimes with faint blue luster; legs entirely black or with reddish fascia on the mesofemora and metafemora; antennal club broad, 11$^{th}$ segment more or less asymmetric; head, pronotum, and elytra distinctly punctuate, elytra without clearly punctate rows (in rare case, blurry punctate rows can be found in *S. grande*); male metasternum with well developed setal patch; male pronotum more raised above elytra and relatively slightly longer than that of female; male protarsi without dense setae on ventral side, male protibiae more or less incurved with apical or/and subapical projections on inner side, male profemora without/with projection on inner side, tubercles present on both inner sides of protibiae and ventral sides of profemora; aedeagus with parameres slightly incurved, internal sac of median lobe with sclerites of characteristic structure.

The structure of internal sac is diagnostic in many taxa of the subfamily Scaphidiinae. In the *Scaphidium grande*-complex, it is composed of five parts (from apex to base): longitudinal bands, apical sclerotized rods, median sclerite, subbasal sclerite, and basal sclerotized plates. The longitudinal bands can usually be hardly observed in the aedeagi of *Scaphidium*, but they are very distinct in species of this complex, and even appear to be sclerotized. The shape of the apical sclerotized rods is less important for identification, since it is usually similar in different species and not clearly delimited. The median sclerite is trapeziform with sides curved or prominent in different degrees. The subbasal sclerite has a wing-like shape and is close to the basal sclerotized plates. The basal sclerotized plates are paired and spread out.

The *Scaphidium grande*-complex is possibly one of the more complicated groups in the genus. At present, only males can be identified. Detailed knowledge of the distribution of each species may also be helpful for identification, but presently the distribution gaps are too significant, as is evident from information given below. *Scaphidium grande* is a widely distributed species in South-east Asia and all its Chinese relatives seem to be endemic species restricted to mountain areas. Some species appear parapatric with *S. grande*, but the latter probably occurs only in lower altitudes. This may explain why so many members of the *S. grande*-complex remained hitherto unnoticed. It may be that additional species will be discovered with further field work, in particular in high mountains close to the Himalayas. A biogeographic analysis of the group will also likely provide interesting results but it considered premature at present.

## Material and methods

Specimens examined in this paper were collected in China by hand on decayed wood and fungi in deciduous forests and killed with ethyl acetate. For examination of male genitalia, the last two abdominal segments were detached from the body after softening in hot water. The aedeagus was separated, placed in glycerin in a cavity of plastic slide, and sealed by a glass slide. Photos of aedeagi were taken with an Olympus DP71

CCD attached to Olympus SZX 16 stereoscope; other photos were taken with a Cannon macro photo lens MP-E 65mm attached to a Cannon EOS40D camera.

The following abbreviation is used for body measurements:

**BL** body length, measured from the anterior margin of clypeus to the apex of abdomen.
**ED** distance between eyes at narrowest point
**FL** length of male profemur
**FW** width of male profemur
**PL** length of pronotum along the median line
**PW** width of pronotum

The type material and additional material treated in this study are deposited in following localities:

**HBUM** Museum of Hebei University, P. R. China (G.-D. Ren)
**SEM** Shanghai Entomology Museum, the Chinese Academy of Science, P. R. China (X.-W. Liu)
**SHNU** Department of Biology, Shanghai Normal University, P. R. China (L. Tang)

## Results

**Key to the species of *Scaphidium grande*-complex**

1. Mesofemora and metafemora black with reddish fascia ..... **2**
– Mesofemora and metafemora totally black without reddish fascia ..... **6**
2 Distinctly elongated body form; male profemora slender (Fig. 22), FW/FL=0.14. Habitus (Figs 4, 5), aedeagus (Figs 19, 20). BL: 7.5–9.9 mm. China (Hainan) ..... ***S. longum***
– Stout body form; male profemora stout, FW/FL >0.155..... **3**
3. Smaller body size, BL<7.4 mm; male profemora (Fig. 26) with an acute angle at apical third, protibiae (Fig. 26) with a blunt angle before apical angle. Habitus (Figs 6, 7), aedeagus (Figs 23, 24). 5.9–7.3 mm. China (Anhui)....***S. spinatum***
– Larger body size, BL>8.4 mm ..... **4**
4. Wider body form, PL/PW of male no more than 0.75, PL/PW of female no more than 0.69; lateral sides of pronotum shallowly incurved near antebasal row of punctures; male protibia incurved..... **5**
– Narrower body form, PL/PW of male: 0.79–0.84, PL/PW of female: 0.75–0.77; lateral sides of pronotum almost straight near antebasal row of punctures; male protibia (Fig. 18) almost straight. Habitus (Figs 1–3), aedeagus (Figs 14–16, also see Fig. 71 in Löbl, 1992 and Fig. 10 in He et al., 2008). BL: 8.4–9.4 mm. China (Yunnan, Guangxi, Guangdong, Fujian, Hunan, Guizhou, Sichuan, Chongqing, Hainan, Taiwan), Burma, India, Indonesia, Laos, Malaysia, Thailand, Vietnam..... ***S. grande***

5. Male profemora strongly swollen at basal 2/3 forming a blunt angle at apical third, protibiae = 2.8 mm (Fig. 30). Habitus (Figs 8, 9), aedeagus (Figs 27, 28). BL: 8.9–9.4 mm. China (Yunnan) ..... ***S. laxum***
– Male profemora not swollen, protibiae = 3.6 mm (Fig. 34). Habitus (Figs 10, 11), aedeagus (Figs 31, 32). BL: 10.1 mm. China (Yunnan) .... ***S. inflexitibiale***
6. Last antennal segment (Fig. 41) light brown in about apical third. Habitus (Fig. 2 in He, 2009, regarded as *S. dureli*), aedeagus (Figs 39, 40). BL: 8.0–9.1 mm. China (Xizang) ..... ***S. liui***
– Last antennal segment (Fig. 37) entirely blackish. Habitus (Figs 12, 13), aedeagus (Figs 35, 36). BL: 6.8–9.5 mm. China (Guizhou) ..... ***S. reni***

### *Scaphidium grande* Gestro, 1880

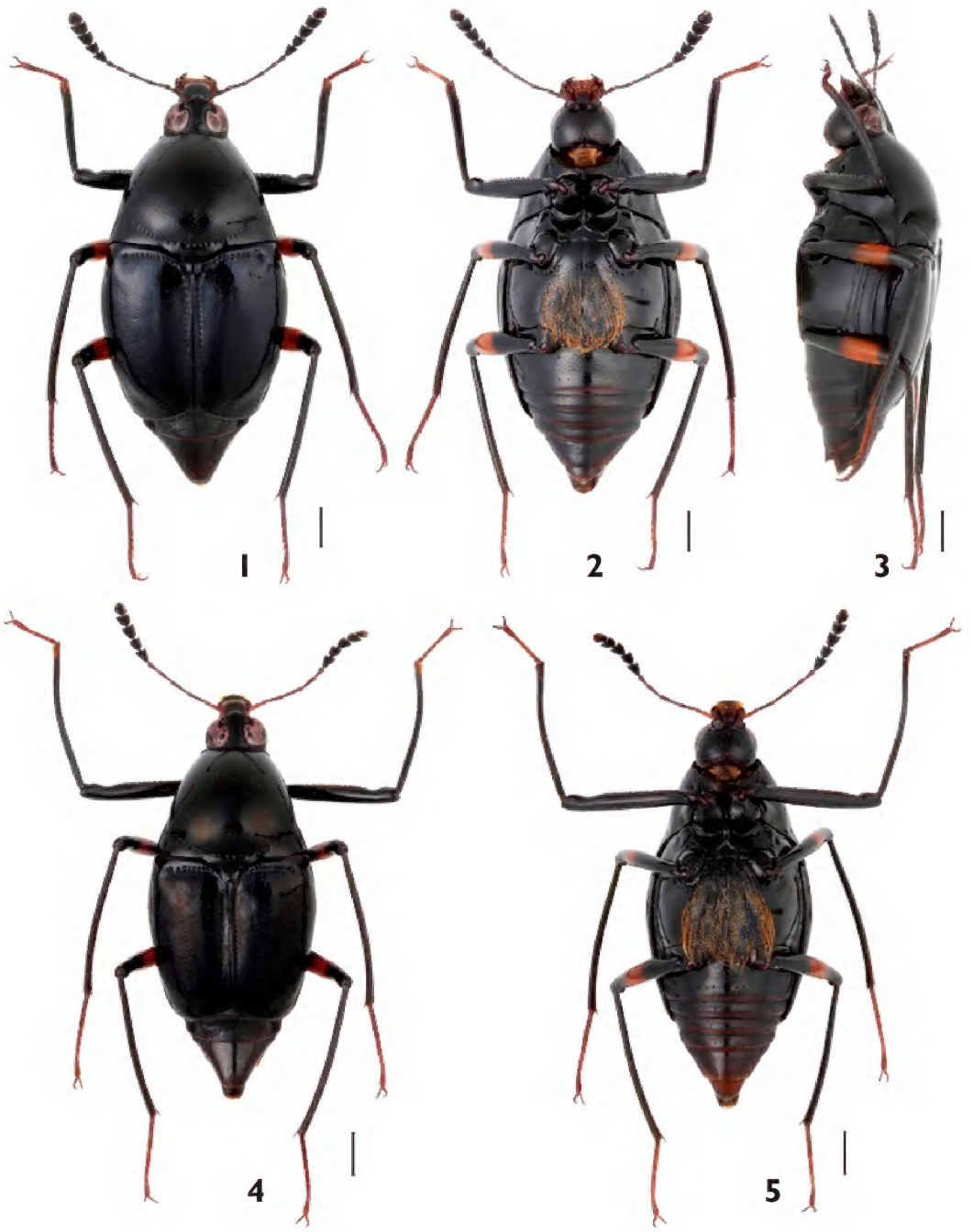
Figs 1–3, 14–18

*Scaphidium grande* Gestro, 1879: 50; Pic, 1915: 3, 1920: 189; Achard, 1924: 91; Löbl, 1992: 488; He et al., 2008: 181.

**Material examined. CHINA: Hainan:** male, Wuzhishan City, Shuiman, 23–25.V.2007, coll. Ba Yi-Bing & Lang Jun-Tong (HBUM); female, Lingshui County, Diaoluoshan, 1100m, 29.III.1999, Zhou Wen-Yi leg. (SHNU); **Taiwan:** female, Xinzhu County, Jianshi, 13.VI.1993, coll. Chen Chang-Chin (SHNU); **Yunnan:** male, Menla, alt. 670m, 21.IV.1982, coll. Zhang Hong-Liang; male, Jinghong City, 11.VI.1973, coll. Jin Gen-Tao (NO. 24038143, SEM); male, Nabanhe N. R., Manfei, alt. 630 m, 29.VII.2005, coll. LI Jin-Wen & LI Li-Zhen (SHNU); male and female, Menlun, Xipian, alt. 985m, 1.IV.2009, coll. Yin Zi-Wei (SHNU); male and female, Menla, Wangtianshu, alt. 600m, 5.IV.2009, coll. Yin Zhi-Wei (SHNU); **Guangxi:** male, Rong'an County, Xishan Forest Farm, Hongchagou, 26.VII.2006, coll. LI Li-Zhen (SHNU); female, Shangsi County, Pinglongshan, 6.IV.2002, alt. 350–500m, coll. Shi Ai-Ming (HBUM); **Guangdong:** male, Nanling N. R., Waterfall group, VII.2006, coll. Wang Zi-Chen (SHNU); male, Nanxiong City, Yuntan street, 3.V.2007, coll. Huang Bao-Ping (SHNU); **Fujian:** male, Yong'an County, Xiyang, 19.IV.1962, coll. JIN Gen-Yao (NO. 24110832, SEM); female, Fuzhou City, Shoushan, Beifeng, V.2004, coll. Li Min (SHNU); female, Wuyishan, 27.V.2002, Li Li- Zhen leg. (SHNU); **Hunan:** female, Tongdao County, Shangyan, 24.VII.2004, coll. Wang Ji-Liang (HBUM); **Guizhou:** Fanjingshan, Heiwan Reiver, 800m, 3.VIII.2001, Ma jing leg. (SHNU); **Sichuan:** female, Luding, Moxi, alt. 1300m, 20.V.2009, He Wen-Jia leg. (SHNU); **Chongqing:** male, Jiangjin, Simianshan, 10.VII.2005, coll. Zhang Wei-Wei (SHNU).

**BL:** 8.4–9.4 mm, ED: 0.23–0.26 mm, PL/PW of male: 0.79–0.84, PL/PW of female: 0.75–0.77.

Body black and glossy, mesofemora and metafemora with reddish fascia. Frons densely punctuate with an impunctate portion on vertex, punctures mostly elongate and slightly confluent. Pronotum raised above elytra, with lateral edges slightly sinu-




**Figures 1–5.** Adult habitus of *Scaphidium.* **1–3** *S. grande* **4, 5** *S. longum*. Scales = 1 mm.

ate. Antebasal row of punctures impressed; disc densely punctuate, punctures round and well delimited, puncture intervals mostly a little larger than diameters. Elytra with humeral protuberance indistinct, apical portion moderately impressed; discal punctation similar to that of pronotum, punctures on apical portion slightly larger; discal row of punctures absent; basal stria row impressed, with punctures about as coarse as those of pronotal antebasal row; sutural stria row of punctures relatively fine. Prohypomera smooth with very fine and sparse punctures mainly on outer half. Mesepisterna smooth with moderately dense, moderately fine, and very shallow punctures. Exposed abdominal sternites and tergites with coarse and relatively sparse punctures and densely reticulate microsculpture. Legs long, mesotibiae and metatibiae slightly curved.

**Male.** Metasternum impressed in middle, with long semi-erect pubescence. Profemora (Fig. 18) with tubercles arranged in three rows on ventral side. Protibiae (Fig. 18) slightly incurved with a small apical angle and tubercles on inner side. Variation of internal sac of aedeagus as in Figs 14–16.

**Distribution.** China (Yunnan, Guangxi, Guangdong, Fujian, Hunan, Guizhou, Sichuan, Chongqing, Hainan, Taiwan), Burma, India, Indonesia, Laos, Malaysia, Thailand, Vietnam.

**Diagnoses.** This is a rather variable species, especially in body size and punctuation (Löbl 1992). Among the material we examined was one male from Hainan Prov. with three blurry rows of puncture consisting of coarse punctures.

***Scaphidium longum*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:B319E6AD-2948-454E-84DE-BC9B76FBB269
Figs 4, 5, 19–22

Type material. **Holotype. China: Hainan:** male, glued on a board with labels as follows: "China, Hainan, Limu Shan, alt. 800m, 20.IV.2009, Zhu Xiao-Yu leg." "Holotype / *Scaphidium longum* / Tang & Li"[red handwritten label] (SHNU). **Paratypes.** 9 males and 10 females, alt. 800m, 20.IV.2009, Zhu Xiao-Yu leg. (SHNU)

**BL:** 7.5–9.9 mm, ED: 0.31–0.39 mm, PL/PW of male: 0.82–0.86, PL/PW of female: 0.77–0.80.

Similar to *S. grande* in most respects, but differs in the following characters: body form distinctly elongate; pronotum more convex; antennal club (Fig. 21) slenderer; male metasternum with larger setal patch; punctation of pronotum slightly finer and sparser; male profemora (Fig. 22) longer and slenderer, tubercles smaller; male protibiae (Fig. 22) longer and more incurved with a small subapical expansion and an apical angle on inner side; internal sac of aedeagus as in Figs 19, 20.

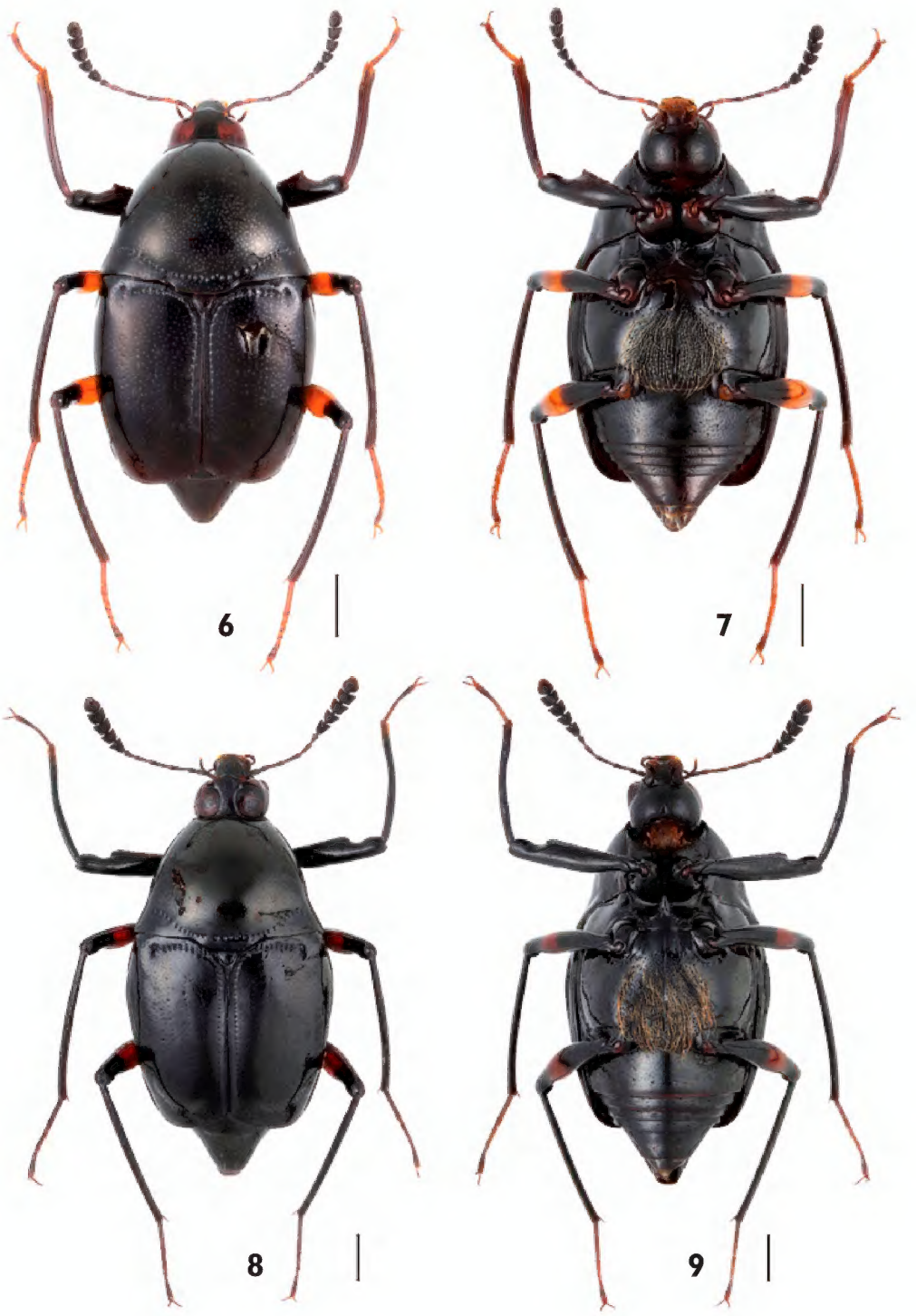
**Diagnoses.** This species can be easily distinguished from other related species by the elongate body.

**Etymology.** The Latin adjective "*longum*" refers to the elongate body and male legs of the new species.

Biological notes. All specimens were collected from a log covered with white fungus (Fig. 43). Territorial behavior of the male was observed by the collector, and it was described as follows: Each male occupies a small area on the fungi. Normally they highly raise bodies upon their long legs and they can shake their bodies up and down rapidly. Once, a small male was too close to a large one, the large male rushed to it immediately and the small male retreated quickly, without having body contact.

***Scaphidium spinatum*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:8943975D-58F1-4FD0-825D-C0FD1E29A77E
Figs 6, 7, 23–26

**Type Material. Holotype. China: Anhui:** male, glued on a board with labels as follows: "Yuexi Couty, Yaoluoping Village, 17.VII.2007–4.VIII.2007, coll. Ba Yi-Bing, Lang Jun-Tong & Wang Feng-Yan " "Holotype / *Scaphidium spinatum* / Tang & Li"




**Figures 6–9.** Adult habitus of *Scaphidium.* **6, 7** *S. spinatum* **8, 9** *S. laxum*. Scales = 1 mm.

[red handwritten label] (HBUM). **Paratypes.** 6 males, 12 females, same data as for the holotype (male, female in SHNU, rest in HBUM).

**BL:** 5.9–7.3 mm, ED: 0.27–0.32.mm, PL/PW of male: 0.78–0.80, PL/PW of female: 0.75–0.79.

Similar to *S. grande* in most respects, but differs in the following characters: antennal club (Figs 25) relatively stouter; most punctures on head well delimited, connected by weakly confluent traces; apical portion of elytra indistinctly impressed; male profemora (Figs 26) with inner side expanded gradually from base forming an acute angle at apical third, tubercles smaller and sparser; male tibiae (Figs 26) with two widest points forming a blunt and a sharp angle on inner side at about apical 1/5 and apical end respectively; internal sac of aedeagus as in Figs 23, 24.

**Distribution.** China (Anhui).

**Diagnoses.** This species can be easily distinguished from other member of the species complex by its small body size.

**Etymology.** The Latin adjective "*spinatum*" refers to the spined male profemora of the new species.

Biological notes. All specimens were collected from a log covered with fungi.

***Scaphidium laxum*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:4A4DCB65-F331-4D60-82DB-ECBD517ED629
Figs 8, 9, 27–30

**Type Material. Holotype. China: Yunnan:** male, glued on a board with labels as follows: "China, Yunnan, Nabanhe N. R., Benggangxinzhai, alt. 1750 m, 3.V.2009, Hu Jia-Yao & Yin Zi-Wei leg" "Holotype / *Scaphidium laxum* / Tang & Li" [red handwritten label] (SHNU). **Paratype.** female, same as for the holotype. (SHNU)

**BL:** 8.9–9.4 mm, ED: 0.33–0.35 mm, PL/PW of male: 0.75, PL/PW of female: 0.69.

Similar to *S. grande* in most respects, but differs in the following characters: body form slightly wider, posterior-lateral angles of pronotum more prominent; male profemora (Figs 30) with inner side expanded gradually from base to form a blunt angle at apical third, tubercles smaller and sparser; male tibiae (Figs 30) more incurved; internal sac of aedeagus as in Figs 27, 28.

**Etymology.** The Latin adjective "*laxum*" refers to the broad body form of the new species.

Biological notes. Specimens were collected from a log covered with white fungi while mating (Fig 44).

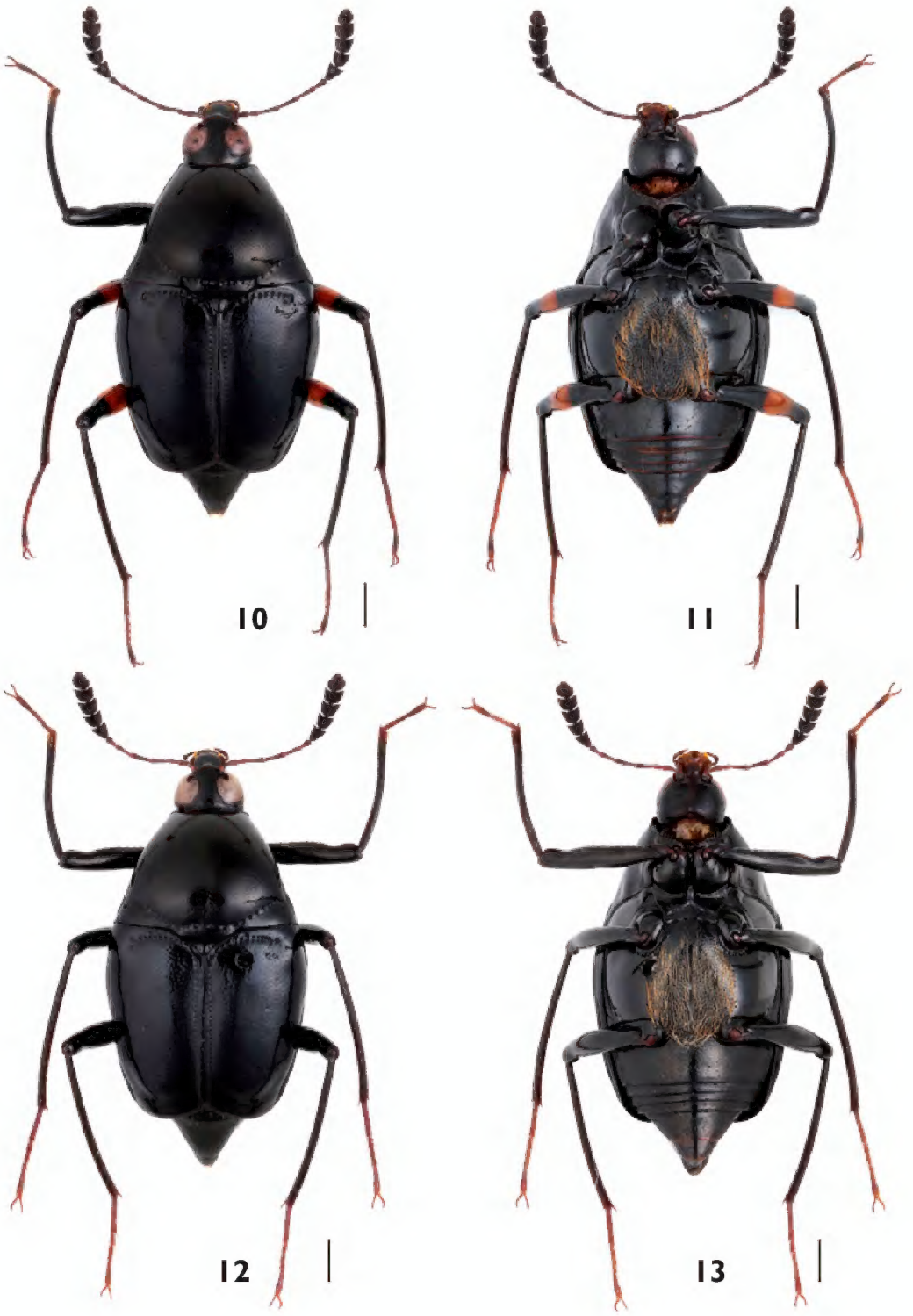
***Scaphidium inflexitibiale*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:6795EADC-717B-4025-8826-F5D69F740FFF
Figs 10, 11, 31–34

**Type Material. Holotype. China: Yunnan:** male, glued on a board with labels as follows: "China, Yunnan, Hekou, Yaoshan, N22°49'435", E 103°44'611", alt. 1345m, 22.VII.2006, Huang Hao leg. " "Holotype / *Scaphidium inflexitibiale* / Tang & Li" [red handwritten label] (SHNU).

**BL:** 10.1 mm, ED: 0.33 mm, PL/PW of male: 0.75.

Similar to *S. grande* in most respects, but differs in the following characters: body form slightly wider, posterior-lateral angles of pronotum more prominent; male profemora (Figs 34) longer, tubercles smaller, ventral row of tubercles indistinct; male tibiae (Figs 34) longer and more incurved; internal sac of aedeagus as in Figs 31, 32.

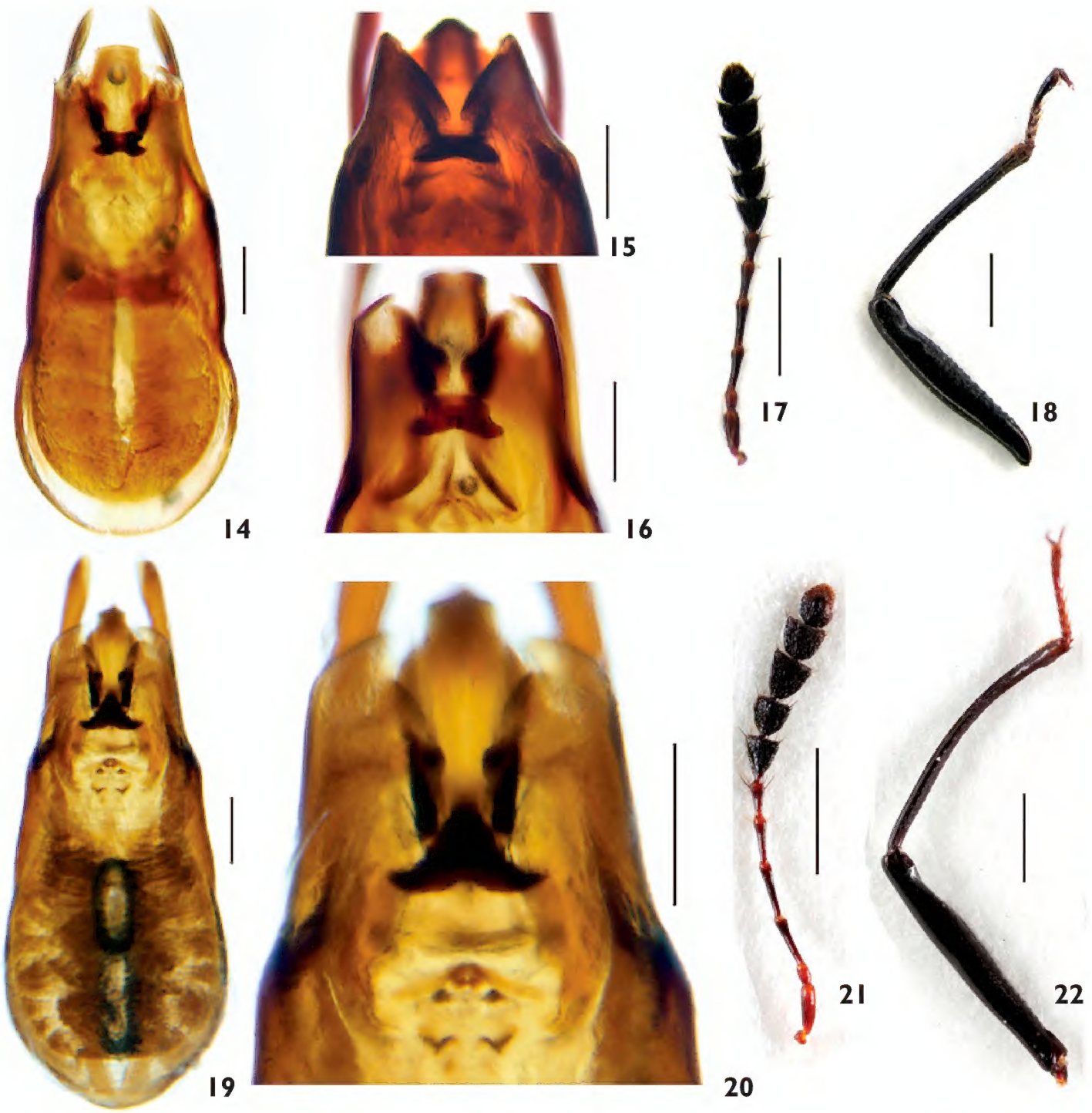
**Etymology.** The specific name is a combination of the Latin words "*inflexi*" and "*tibia*" referring to the incurved male tibia.




**Figures 10–13.** Adult habitus of *Scaphidium*. **10, 11** *S. inflexitibiale* **11, 12** *S. reni*. Scales = 1 mm.

***Scaphidium reni*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:B307CAE3-DBDF-40D1-93F8-29FCA873FE79
Figs 12, 13, 35–38

**Type Material. Holotype. CHINA: Guizhou:** male, glued on a board with labels as follows: "China, Guizhou, Leigongshan N. R., Lianhuaping, alt. 1550–1680m, 13–14.IX.2005, coll. Zhou Zhong-Hui" "Holotype / *Scaphidium reni* / Tang & Li" [red handwritten label] (SHNU). **Paratypes. CHINA: Guizhou:** 6 males, 4 females, Leigongshan N. R., Linchang, 13–14.IX.2005, coll. Liu Hao-Yu, Wang Ji-Liang & Gao Chao (male, female in SHNU, rest in HBUM).



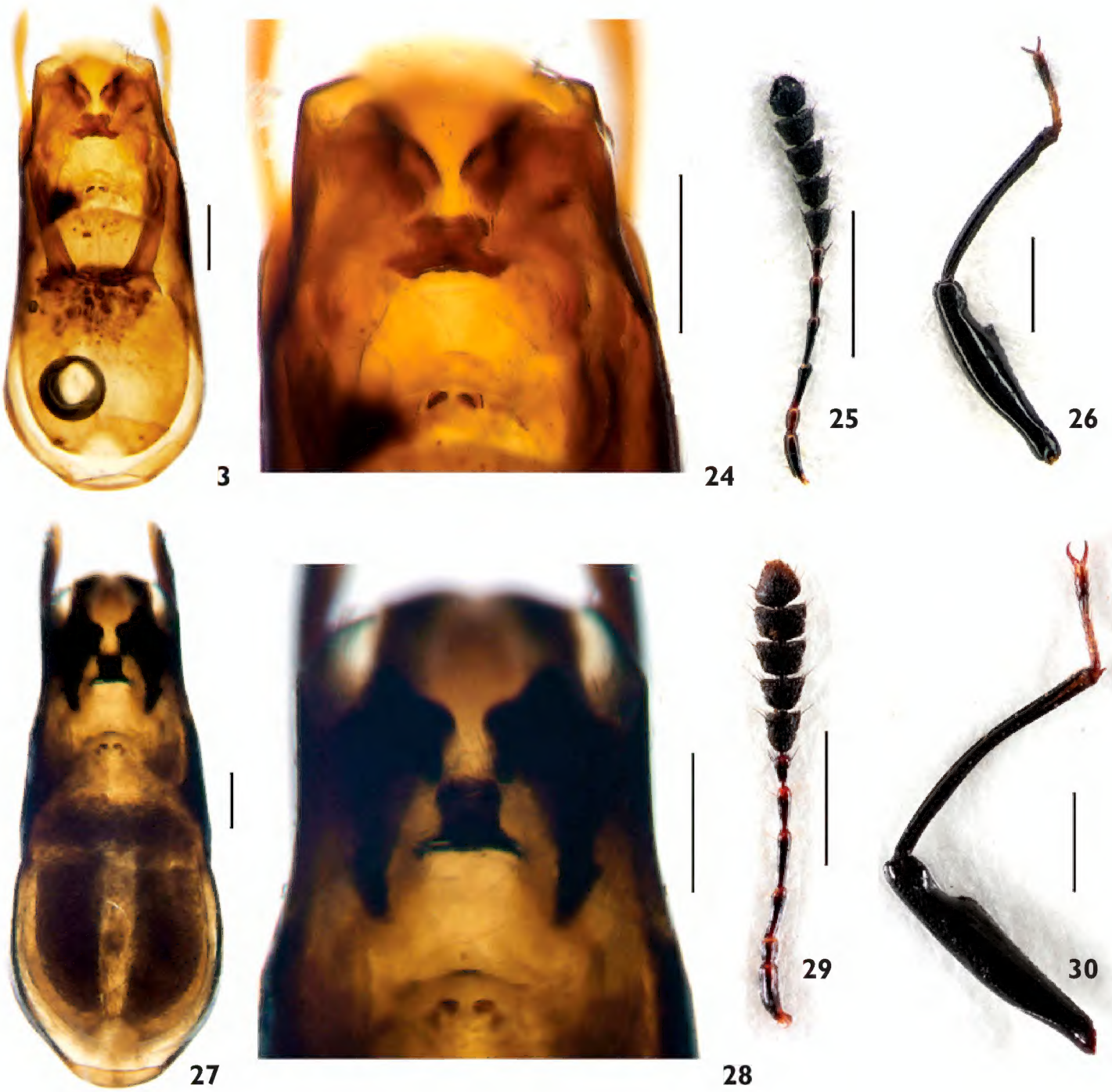

**Figures 14–22. 14–18** *Scaphidium grande* **19–22** *S. longum.* **14** aedeagus (Yunnan) **15** internal sac in detail (Hainan) **16** internal sac in detail (Fujian) **17, 21** antenna **18, 22** male front leg in ventral view **19** aedeagus **20** internal sac in detail. Scales = 0.25 mm (**14–16, 19, 20**), scales = 1 mm (**17, 18, 19, 20**).

**BL:** 6.8–9.5 mm, ED: 0.29–0.37.mm, PL/PW of male: 0.76–0.79, PL/PW of female: 0.72–0.75.

Similar to *S. grande* in most respects, but differs in the following characters: mesofemora and metafemora black without reddish fascia; body form a little wider; male profemora (Figs 38) with smaller tubercles; male tibiae (Figs 38) more incurved; internal sac of aedeagus as in Figs 35, 36.

**Distribution.** China (Guizhou).

**Diagnoses.** *Scaphidium reni* is extremely similar to the following new species *S. liui*; for differences see description of the latter. This species may be easily distinguished from other members of grande-complex by mesofemora and metafemore totally black without reddish fascia.

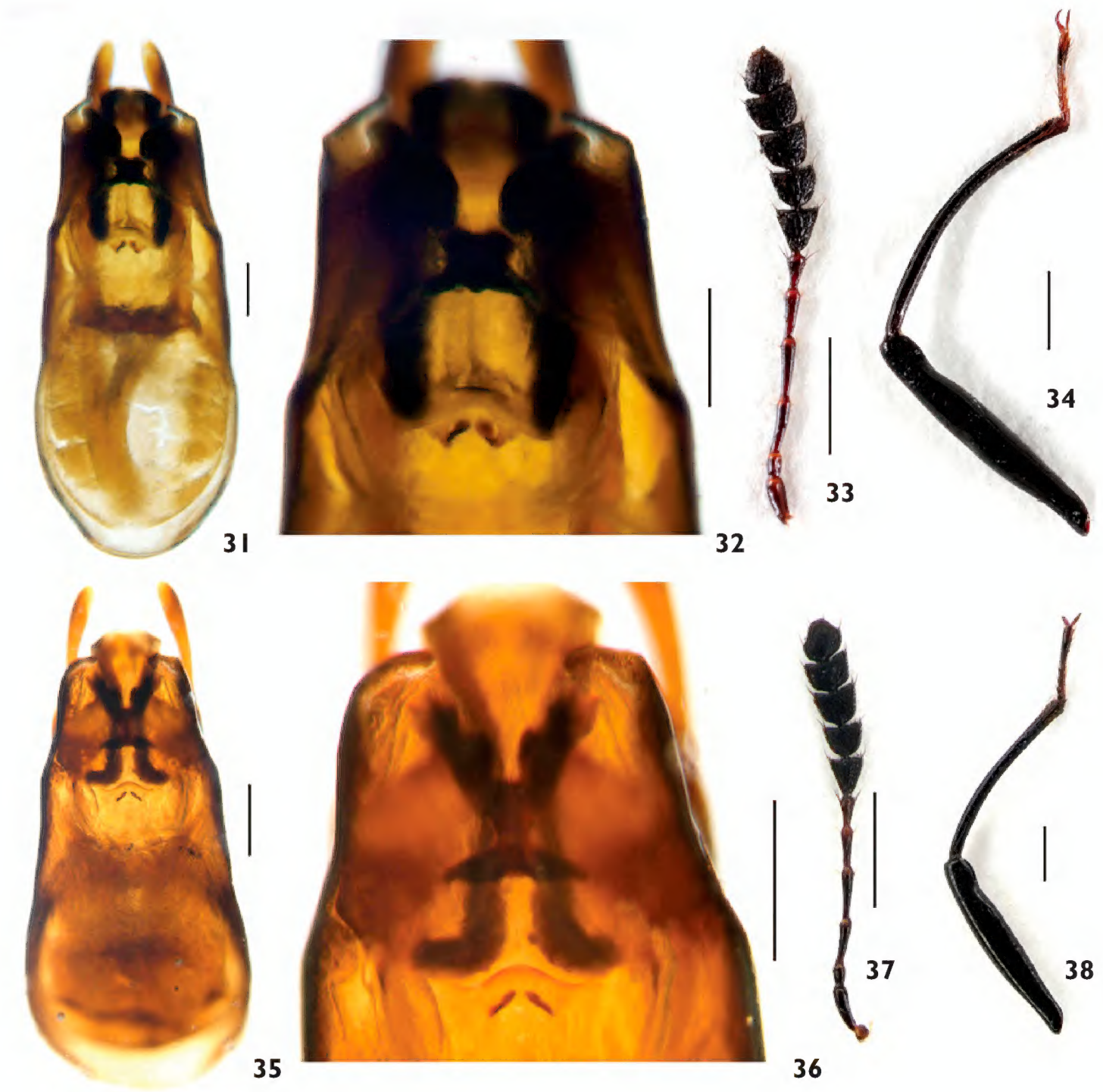



**Figures 23–30. 23–26** *Scaphidium spinatum* **27–30** *S. laxum*. **23, 27** aedeagus **24, 28** internal sac in detail **25, 29** antenna **26, 30** male front leg in ventral view. Scales = 0.25 mm (**23, 24, 27, 28**), scales = 1 mm (**25, 26, 29, 30**).

**Etymology.** This species is named in honor of Prof. Dr. Ren Guo-Dong, who kindly provided specimens of *Scaphidium*.

***Scaphidium liui*** Tang & Li, sp. n.
urn:lsid:zoobank.org:act:940ED9AD-9D44-444F-9628-7384469AE8D6
Figs 39–42

**Type Material. Holotype: CHINA: Xizang:** male, glued on a board with labels as follows: "Xizang, Motuo County, Yadong, alt. 1250m, 25.V.1980, coll. Jin Gen-Tao & Wu Jian-Yi " "NO. 24205538" "Holotype / *Scaphidium liui* / Tang & Li" [red




**Figures 31–38. 31–34** *Scaphidium inflexitibiale* **35–38** *S. reni*. **31, 35** aedeagus **32, 36** internal sac in detail **33, 37** antenna **34, 38** male front leg in ventral view. Scales = 0.25 mm (**31, 32, 35, 36**), scales = 1 mm (**33, 34, 37, 38**).

handwritten label] (SEM). **Paratypes. CHINA: Xizang:** female, Motuo Couty, Kabu, 1070m, 14.V.1980, coll. Jin Gen-Tao & Wu Jian-Yi (NO. 24205537, SEM).

**BL:** 8.0–9.1 mm, ED: 0.36–0.40 mm, PL/PW of male: 0.79, PL/PW of female: 0.76.

Extremely similar to *S. reni* sp. n., differing only in the following characters: body form slightly narrower; last antennal segment light brown in about apical third; apical portion of elytra indistinctly impressed; internal sac of aedeagus as in Figs 39, 40.

**Distribution.** China (Xizang).

**Diagnoses.** This new species was wrongly recorded as *S. dureli* Achard, 1922 in He et al., 2009. *Scaphidium dureli* is now known only from the type locality "British

**Figures 39–42.** *Scaphidium liui*. **39** aedeagus **40** internal sac in detail **41** antenna **42** male front leg in ventral view. Scales = 0.25 mm (**39, 40**), scales = 1 mm (**41, 42**).

**Figures 43, 44. 43** Host fungus of *S. longum* (Photo by Mr. Zhu Xiao-Yu) **44** *S. laxum* mating on a log with fungi (Photo by Mr. Hu Jia-Yao).

Bootan Padong". It can be easily distinguished from members of the *S. grande*-complex by the last antennal segments being entirely ochreous and by the absence of sexual characters on the male profemora.

**Etymology.** This species is named in honor of Prof. Liu Xian-Wei who kindly provided the *Scaphidium* specimens.

## Acknowledgements

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Yi-Bing (HBUM) for various help; and to all the collectors mentioned in this paper. The research was supported by National Natural Science Foundation of China (No. 30870323), National Natural Science Foundation of Shanghai (No. 10ZR1421600), Shanghai Municipal Education Commission (No. RE904), Shanghai Normal University (No. SK200911), and Doctoral Fund of Shanghai Normal University (No. PL926).

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